



## The effect of baroclinicity on the wind profile in the planetary boundary layer

Floors, Rogier; Peña, Alfredo; Gryning, Sven-Erik

*Published in:*  
EMS Annual Meeting Abstracts

*Publication date:*  
2013

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Floors, R., Peña, A., & Gryning, S-E. (2013). The effect of baroclinicity on the wind profile in the planetary boundary layer. In *EMS Annual Meeting Abstracts* European Meteorological Society. EMS Annual Meeting Abstracts Vol. 10 <http://www.ems2013.net/>

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



## **The effect of baroclinicity on the wind profile in the planetary boundary layer**

R. Floors, A. Peña, and S-E. Gryning

DTU Wind Energy, Technical University of Denmark, Risø Campus, Roskilde, Denmark

The wind in the free atmosphere is an important parameter for the estimation of wind resources at typical heights of wind turbines. Mesoscale models, such as the weather research and forecasting (WRF) model, are often used to perform downscaling from the large-scale model data to the wind speed near the surface at a certain site. In this study, the wind in the free atmosphere is estimated by using the gradients of the pressure and temperature fields from WRF in an area surrounding the site of interest and therefore we can estimate the effect of geostrophic wind shear (baroclinity) on the wind profile in the planetary boundary layer (PBL).

The effect of geostrophic shear is studied with a wind lidar that measures the wind profile up to a 1000 metres. Two years of wind speed observations are available from sites in Denmark and Germany. In addition, radio soundings from a two-week intensive campaign and measurements from tall meteorological masts are used. It is found that the flow is often baroclinic and that the effect on both wind speed and turbulent structure of the PBL is profound. We discuss the effect of baroclinicity on the empirical constants in the geostrophic drag law and how this study can be used to improve the assessment of wind energy resources.